Center For Standards 10 September 1996

Memorandum for Distribution

SUBJECT: Minutes - Ad hoc Working Group of the SSMC

1. Introduction. The Symbology Standards Management Committee (SSMC) Ad Hoc Working Group meeting was held 6 September 1996 by the Chair, CDR Rocky Wells, Syntax and Symbology Division, Center for Standards (CFS), Joint Interoperability and Engineering Organization (JIEO), Defense Information Systems Agency (DISA). The following voting member organizations were represented by the individuals listed:

Chairman, Joint Chiefs of Staff	LTC Roper
Chief of Staff, U.S. Air Force	Mr. McKinnon
Chief of Staff, U.S. Army	LTC Salice
Chief of Naval Operations	CDR Whitkop

The roster of attendees is provided in enclosure 1.

2. Objective. The objective of the working group was to focus on issues and concerns regarding validation testing of MIL-STD-2525A. There were three issues stated during the meeting. The first issue was the question of need for the validation test. The second issue centered on the structure of the test, its ultimate validity (i.e., incorporation into simulators and actual equipment) and software to capture testing results. The third concerned funding (how much, who will provide it, and who will act as the executive agent).

3. Need for testing. Commander Wells opened the discussion by questioning the need for validation testing. He noted that the U.S. Army's FM101-5-1 is apparently going to be issued without testing. The services need to provide detailed concrete reasons for the testing so they can be presented for funding support. Service comments indicated that the service communities have a strong desire to operationally test MIL-STD-2525A prior to the implementation of the standard (enclosure 2). It was recommended that it would be beneficial for the services to incorporate validation testing into service specific environments through the use of computer workstations as well as simulator equipment.

The Army offered three points. First, FM 101-5-1 is new and a radical change from the previous edition, so the validation of MIL-STD-2525A will serve as a validation of 101-5-1. Second, since 101-5-1 is a USA/USMC combined manual, the Army and the Marine Corps feel that the validation can occur during Prairie Warrior. The Army would provide some of the funding to accomplish this. Third, the Army believes that the tests may provide data that MIL-STD-2525A is a strong document and that it may only need some minor modification. The Army representative

feels strongly that the Army will accept 2525.

The chair advised that DISA does not normally operationally test standards. DISA officials feel that standards have no need to be tested since they reflect the contents of the manuals, handbooks, etc., already in use by the services.

4. Structure. It was evident through the service responses to the JIEO proposed test plan that there is confusion as to some of the objectives and structure of the validation test plan. Dr. Fernandes volunteered to fix the plan to reflect that it has two distinct parts: confusion matrix and operational testing. Additionally, the validation test plan objective is not to test against STANAG 4420, but rather to incorporate some of its testing operations and baseline principles. It was noted that there are three parts to the testing equation: the test itself, the equipment on which the testing may be performed, and the software needed to capture test responses.

5. Funding. Funding was discussed at some length. Commander Whitkop, N62, suggested that funding be handled by the Office of the Secretary of Defense. His rationale was that this issue involves many facets and systems of the command and control community and, therefore, deserves to be funded by OSD. The Chair noted that funding by DISA was not an option unless it was specifically provided for by a higher board.

6. Interactive Training Tool (ITT). Mr. Scott Herman, ASPO support, provided a briefing about the Interactive Training Tool (ITT), and its use in validation testing of MIL-STD-2525A (enclosure 3). Some services currently use this imagery analysis tool for testing. ITT provides a wide range of display and graphic capabilities which can be modified to cater to the testing needs.

The basis of the test is that the operator would have scattered truth markers displayed on a monitor where he would have to correctly identify chosen markers from a description list. The database records the correct and incorrect responses and logs the final score where the administrator can then evaluate the results.

Questions and examples were brought up as to how the testing operations can be modified in order to provide specific analysis focuses. It was stated that the testing questions can be molded to provide a more specific emphasis. ASPO will try to ascertain, prior to the next SSMC, whether the software can be modified to suit the validation testing needs. Other avenues are also to be explored by all interested parties.

7. Other Alternatives. It was also suggested that perhaps COMPASS, a modeling simulation tool sponsored by NRAD, be looked into as a potential testing means, along with ITT. Dr. Fernandes advised the group that she would look into getting more information about the program.

8. Summary. It was reemphasized that testing is desired and required by the services. Specific service needs must be identified to capture funding. An executive agent would need to be appointed to organize and monitor the testing process which would be carried out by the services. The Validation Test Plan for MIL-STD-2525A draft plan, dated May 1996, was said to be a good

general plan, and Dr. Fernandes will modify it to be less ambiguous so that it will work as a baseline (enclosure 4).

Roger Wells, Commander, USN
Chair, Symbology Standards
Management Committee

Distribution (services and participants only)
Enclosures

1. Attendance roster
2. Service responses to validation testing
3. Interactive Training Tool presentation
4. Draft Validation Test Plan

DISTRIBUTION:

Joint Staff, J-6I, ATTN: LTC Ned Roper, The Pentagon, Washington, DC 20318-6000
U.S. Army, ATTN: DAMO-FDQ, LTC Hank Salice, 400 Army Pentagon, ODCSOPS, Washington, DC 20310-0400
Chief of Naval Operations (N62), Attn: CDR Bob Whitkop, 2000 Navy Pentagon, Washington, DC 20350-2000
U.S. Navy Space and Naval Warfare Systems Command, ATTN: Code 3311C (Mr. John Pucci), 2451 Crystal Drive, Arlington, VA 22245-5200
Commander, Naval Command Control and Ocean Surveillance Center, RDT&E Division, Code 4221 (Dr. Kathleen Fernandes), Rm 423, 53140 Gatchell Rd., San Diego, CA 92152
U.S. Air Force, HQ AFC4A/TNBC, ATTN: Mr. Rex McKinnon, 203 W. Losey St., Rm 2000, Scott AFB, IL 62225-5238
U.S. Marine Corps, HQMC C4I, ATTN: Maj Shelton Lee, Two Navy Annex, Arlington, VA 20380-0001
U.S. Army Space Program Office, ATTN: Maj Charles Wright, 2810 Old Lee Hwy, Suite 300, Fairfax, VA
U.S. Army Space Program Office, ATTN: Mr. Scott Herman, 2810 Old Lee Hwy, Suite 300, Fairfax, VA
Marine Corps Combat Development Command Doctrine C42, Attn: Mickael Krivdo, 3300 Russell Rd., Quantico, VA 22134-5021
DISA/CFS, Attn: CDR Rocky Wells, Parkridge III, Rm 3304, 10701 Parkridge Blvd, Reston VA 20191-4357

ENCLOSURE 1

ATTENDEE ROSTER
Symbology Standards Management Committee Working Group Meeting
6 September 1996

Beal, Thom	**Mr.**	**Logicon**
Cincala, Steve	**Mr.**	**Logicon**
Fernandes, Kathy	**Dr.**	**NRAD, Code 4222**
Herman, Scott	**Mr.**	**ASPO Support**
Kukrus, Barbara	**Ms.**	**Logicon**
McInnes, Peter	**Mr.**	**ASPO, ITT contractor**
McKinnon, Rex	**Mr.**	**HQ AFCA/TNB**
Pucci, John	**Mr.**	**SPAWAR**
Roper, Ned	**LTC, USA**	**JCS, J6I**
Salice, Hank	**LTC, USA**	**HQDA DAMO - FDQ**
Wells, Rocky	**CDR, USN**	**JIEO/CFS**
Whitkop, Bob	**CDR, USN**	**OPNAV-N62**

ENCLOSURE 2

DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS
400 ARMY PENTAGON
WASHINGTON DC 20310-0400

REPLY TO ATTENTION OF

DAMO-FDQ

16 July 1996

MEMORANDUM FOR DIRECTOR, JOINT STAFF DIRECTORATE J-6 ATTN: J-6I (LTC ROPER)

SUBJECT: Validation Testing of Military Standard 2525-Common Warfighing Symbology

1. The Army has long been a proponent for the validation testing of Military Standard 2525-Common Warfighting Symbology, prior to accepting the standard. The Army believes that MIL STD 2525A will be acceptable for the use in future digitized battlefield displays. The validation test objectives must be developed jointly and the test be administered by a single team. However, the Services must be allowed to incorporate the test into Service specific exercises.

2. The Army believes that MIL STD 2525 should be tested against STANAG 2019 for the force domain testing. Specific comments to the proposed test plan are contained at TAB A. POC for this action is LTC Salice, DSN 227-6676.

for Henry J. Salice Jr LTC, GS

ROBERT K. BILLINGS
Colonel, U.S. Army
Chief, Concept, Doctrine & Force Policy

DAMO-FDQ

SUBJECT: Validation Testing of Military Standard 2525,-Common Warfighting Symbology

1. The following are Army comments concerning the proposed validation test plan. Request the Joint Staff review these comments and successfully address the Army concerns:

a. Page 1, Section II, 1st para: Who will provide for the funding for the SunSpac or Hewlett Packard workstations?

b. Page 2, Section II, 1st para: The symbology has already been through a recognition test using STANAG 4420. What data can be collected from previous tests? Further more the Army prefers to test MIL STD 2525 with STANAG 2019 and FM 101-5-1 for the force domain test.

c. Page 2, Section II, para 3: If the test subjects are to be officers and enlisted from the Services, the Army does not see a requirement to also test a limited group of civilians "*to measure performance in absence of prior experience.*" This appears to add unnecessarily to the cost of the test.

d. Page 3, Section IV, first bullet: Identify the "lead organization."

e. Page 3, Section IV: The Army Staff does not believe that the entire process should take 18 months. The longer this is dragged on the more expensive the test becomes.

f. Page 3, Section IV, bullet 3, the term "test sites" is taken to be synonymous with the term "exercise sites." It is the intent of the Army and the Marine Corps to conduct the test during a funded exercise such as Prairie Warrior.

g. Page 3, Section V, Budget. The Army would like an explanation of the estimated cost. See the Army's budget estimate in the Army's proposed plan (Enclosure 1).

h. Page 4, para 1: The Army wants STANAG 2019 and FM 101-5-1 be added to the test. REASON: Completeness.

SAMPLE VALIDATION TEST PLAN

1. In formally evaluating results, criteria for test stimuli should include:

    a. Known standards for discriminability, searchability and learnability.

    b. Content criteria (the breadth and information depth of a symbol).

    c. Tactical criteria (assessing the impact on tactical decision making).

Testing tasks should concentrate on 'search' (the ability to detect icons in arrays based on features) and peripheral cueing (the commonality between symbols that make them less distinguishable, minimizing feature saliency). When processing multiple symbols, it is necessary that 'discrimination' and "display clutter be addressed. The validation could be a four step exercise and to compress the time identified with each phase, the phases could overlap in certain areas.

Phase I. Develop software for the 'confusion' experiment, and test Service officers separately. The tests should be MIL STD 2525 versus STANAG 4420 for the engagement domain personnel and MIL STD 2525 and FM 101-5-1 versus STANAG 2019 for the force domain personnel. These should be 'within' and "between' subjects designs (within branch sets and between branch sets), dependent measures being search times, detection times, errors of commission and degrees of quality of results, with data submitted to multivariate analysis and to canonical correlation for analysis. Estimate for above; Experimenters (2 @ $10K/ month, 5 months = $100K.); Assistant (1 @ $8k/month, 2 months = $16K.); Equipment: 1 Computer at $16K; Travel: 2 TDY's $3.2K; Software Contract $50K. Service Subjects = $0. Total: $185.2K.

Phase II. Devise a hand-written test, with template, where enlisted personnel are required to draw symbols to a battle scenario. Compare how symbols are drawn and interpreted using MIL STD2525and FM 101-5-1. This should be a 'within' subjects design, dependent measures being time to complete, errors made in doing so, and effectiveness of the product, with data submitted to multiple ANOVA techniques for analyses. Estimate for above; Experimenter (1 @ $10K/4 months = $40K); Assistant (1 @ $8K/2 months = $16K); Equipment (templates @ $5 each @ 20= $100.00); TDYs $2K; Service Subjects: $0. Total: $58.1K.

Phase III. Devise a test to determine how quickly/slowly naive subjects can learn MIL STD 2525A symbolics. This should be a 'within' subjects design, with3 levels of stimuli complexity, dependent measures being times taken to learn and percent of errors made while doing so, with data submitted to a canonical correlation for predicting difficulties in areas of each symbol set. Estimate for above; Experimenter (1 @ $10k/5 months = $50K); Assistant (1 @ $8K/2 months = $16K); Equipment $0; TDYs $2K; Software contract @10K; Service Subjects: $0. Total: $68K.

Phase IV. Write software for comparison tests during Exercise PRAIRIE Warrior 97 for use on the MSC/Phoenix system, where MIL STD 2525A and FM 101-5-1 v. 1985 are portrayed to compared mission results. Create questionnaires concerning MIL STD 2525A performance. Also video and audio tape personnel during the action for future assessment. Estimate for above; Experimenter (2 @ $10K/4 months = $80K); Assistant (1 @ $8/1 month = $8K); Equipment (Video @ $500); TDYs $3K; Contract for Software $30K; Service Subjects: $0. Total: $121.5K.

Total Estimate: $432.8K

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC

MEMORANDUM FOR LT COL NED ROPER (J6I) 23 JUL 1996

FROM: HQ USAF/SCTA
1250 Air Force Pentagon
Washington, DC 20330-1250

SUBJECT: Validation Testing Of Military Standard 2525 - Common Warfighting Symbology, J6A00524-96, 17 June 96

We have reviewed the test plan and the following comments are provided:

a. We are concerned that conducting the testing in a highly sanitized laboratory environment using SunSpare or Hewlett Packard workstations will not adequately simulate the operational systems and environment where the MIL-STD will be used. The validation testing must consider the various sizes and types of displays that may use the MIL-STD. A better validation test would be to use existing simulators for these systems (i.e. Operations Centers, AWACS, ABCCC etc.) as the basis for test methodology rather than an engineering-type workstation. Operational personnel who actually use the displays would simulate operational conditions. This validation approach should not require additional resources because existing simulators would be used; however, simulator availability must be coordinated well in advance of testing. This also has the potential to reduce overall testing costs.

b. The draft plan implies that a contractor will be responsible for executing a detailed validation plan. We believe that the contractor should also be responsible for preparing the plan to include operational validation considerations. The Services, Joint organizations and other DOD agencies would provide inputs to and review and coordinate on the plan.

c. We support the test plan; however, FY 96 funding is not available at this time and no FY 97 funding has been budgeted for this requirement. We believe that DISA, Center for Standards should fund this effort as part of their responsibility for developing and managing DOD standards.

d. We believe the overall schedule is too long and the associated cost is too high. The schedule should be shorten to less than 12 months. The cost should not exceed $400K.

e. A test management plan ~~should be written and coordinated to identify~~ organizations and their responsibilities.

f. We cannot commit to participating in the testing until we know to what extend (i.e. number of sites, workstations and operators) and what resources are required of the participating organizations. We will attempt to identify a test site when these details have been

identified. We do not agree with overseeing data collection at the test site. We believe that the testing team/staff should be responsible for data collection.

g. The Air Force has no additional testing requirements.

h. Change title of test plan from Military Standard 2525 to Military Standard 2525A. Rationale: The validation test plan is to test MIL-STD 2525A not the entire MIL-STD 2525.

JAMES D. HART, GS-14, USAF
Architecture Division
Directorate of Architecture and Technology
DCS/Communications and Information

UNITED STATES MARINE CORPS
MARINE CORPS COMBAT DEVELOPMENT COMMAND
QUANTICO, VIRGINIA 22134-5001

IN REPLY REFER TO
3900
C 422
18 Jul 96

From: Commanding General, Marine Corps Combat Development Command, 3300 Russell Road, Suite 318A, Quantico, VA 22134-5001 (C 422)
To: Chairman, Joint Chiefs of Staff (J6I), ATTN: LTC Ned Roper, Washington, D.C., 20318-6000
Via: Commandant of the Marine Corps (CS)

Subj: REVIEW OF VALIDATION TEST PLAN FOR MILITARY STANDARD (MILSTD) 2525A: COMMON WARFIGHTING SYMBOLOGY, VERSION 2

Ref: (a) MILSTD 2525A, Version 2
(b) Draft Validation Test Plan of May 1996
(c) JCS (J6I) Tasking Document J-6A00524-96 of 17 Jun 96

1. Reference (a) is the draft military standard (MILSTD) 2525A, *Common Warfighting Symbology*, of 9 July 1996. Reference (b) is the draft validation test plan for MILSTD 2525A. Reference (c) requested comments and recommendations on the content of the draft document. References (b) and (c) have been reviewed and we concur with the content with the below noted exceptions:

a. Do not concur with testing the MILSTD 2525A symbology against the symbology represented in NATO STANAG 4420. The MILSTD should be tested against a valid symbol set recognized in U.S. systems. STANAG 4420 has not been ratified by the U.S. and does not represent a valid symbology standard to compare the MILSTD 2525A set against. Instead, it should be measured against a valid symbol set such as that found in STANAG 2019, which is ratified by the U.S. The U.S. implementation of STANAG 2019 is FM 101-5-1, *Operational Terms And Symbols*. That publication presents the current USMC/U.S. Army recognized symbol set against which the MILSTD should be evaluated.

b. The Marine Corps continues to insist that operational testing be conducted prior to validation and implementation of this updated version of the MILSTD. While the Marine Corps supports the concept of developing a standard set of symbols, there are issues concerning the readability of these symbols when used in tactical C4I systems. The impact of operator error induced by poorly designed symbology are far reaching and potentially deadly to friendly forces. The impact of using these symbols in a fast paced, tactical scenario has not yet been tested in the operational environment. This is a serious shortcoming that only validation testing can resolve.

c. Recommend revisiting the financial estimates contained within the draft plan and competitively bidding the contract

Subj: REVIEW OF VALIDATION TEST PLAN FOR MILITARY STANDARD (MILSTD) 2525A: COMMON WARFIGHTING SYMBOLOGY, VERSION 2

before continuing. Informal inquiry seems to indicate that the cost figures cited in the draft plan could be reduced considerably as a result of such competitive bidding. The U.S. Army has done some work in this area that warrants further consideration.

2. MCCDC point of contact is Major M.E. Krivdo, Doctrine Division, at DSN 278-2872, Coml (703) 784-2872.

Alfred A. Cortez

ALFRED A. CORTEZ
By direction

DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
2 NAVY ANNEX
WASHINGTON, DC 20380-1775

C4I/CSIM IN REPLY REFER TO:
MCAOM 057-96
21 Jul 1996

From: Major Shelton Lee, CSIM Branch, CS Division, C4I Department
To: LTC Ned Roper, USA, Joint Chief of Staff, J6I Directorate, J-6A 00524-96

Subj: VALIDATION TESTING OF MILITARY STANDARD 2525 -COMMON WARFIGHTING SYMBOLOGY

Encl: CG MCCD, Memo, subject same as above, dated 18 Jul 96

1. I concur with the general concept of the proposed document. However, I recommend the issues identified in the enclosure be resolved prior to the final joint action.

2. If you have any questions, contact me at (703) 695-1817.

S. Lee

S. LEE

25 Jul 96

From: NTCS-A Requirements Officer (N62), CDR Whitkop)
To: Joint Staff (J61, LTC Roper)

Subj: NAVY ACTION OFFICER RESPONSE VALIDATION TESTING OF MILITARY STANDARD 2525 - COMMON WARFIGHTING SYMBOLOGY TASKING

Ref: (a) Joint Staff Tasker, J-6A 00524-96, with attachment

1. Pursuant to reference (a), the Navy received an action item/tasker to review and comment on a draft version of the Validation Test Plan for MIL-STD-2525 common Warfighting Symbology. The following comprises an action officer review of subject document.

a) In the cover sheet, para 3c2 it states that the attached plan "...does not describe procedures for assessing standard symbology operationally. This portion of the validation process will be developed in coordination with the Services at a later date." If this plan is approved, we must still stand fast in not endorsing the mandatory implementation of 2525 until it has been operationally tested. Lab tests, as described in the plan, are only a start. They must be completed in an operational setting to hold validity.

b) Section II para 1

- states "The test session will be conducted with the operator seated at normal viewing distance from the monitor and under normal (i.e., standard office) ambient lighting." This is only one environment where this will be used and others must be evaluated, including dark room and colored lighting conditions. The environment itself is also but a part of the equation, as are the various levels of decision makers viewing the display, since the displays are scaleable across the various C4I systems, and their ability to discern the symbology.

- Additionally, the test procedures call out for testing to be performed using standard tactical hardware (workstations with high-resolution color monitors). Not all systems that will be required to use 2525 will have high resolution color screens. Many tactical displays will be monochrome and lower resolution.

These two issues are critical considerations as part of the testing, in order "...to evaluate its effectiveness in an operational environment."

c)Section V BUDGET

- The issues of funding for the testing are still being forced on the CSA's. Deficiencies against the POM will result in inadequate testing unless testing is funded out of OSD.

- The implications in the FY 97 para include: "...access to space, workstations, and operators and oversee data collection efforts at each site during the six-month testing period." No indications of numbers required for sites and personnel.

2. This plan is a good initial start, but philosophical issues that existed for the inception of MS 2525 with deep service exceptions, are still unresolved, to include heading down the path toward service funding. If the MCEB is going to mandate the implementation of this document, pursue OSD funding to support adequate testing and implementation on existing platforms.

R.N. WHITKOP
CDR USN

ENCLOSURE 3

The Interactive Training Tool (ITT)

The Utility of ITT in MIL-STD-2525 Validation Testing

The Interactive Training Tool (ITT)

- GOTS Software for Sun SPARC platforms
- Designed to assist in the training of Imagery Analysts
- Currently used worldwide at 21 U.S. Army, Air Force, and joint service sites
- Extensive image display and graphic annotation capabilities
- Automated test utility assesses an Analyst's ability to identify objects in imagery

A Typical ITT Session

A typical ITT session consists of the:

- **Presentation of introductory information - provides lesson information to the Analyst**
- **Presentation of tutorials - instructs or illustrates concepts related to the lesson**
- **Administration of identification tests - ascertains the Analyst's understanding of what was taught**
- **Evaluation of test results - quantifies or qualifies the results of the test**

ITT Identification Test

- **An image is displayed with annotations and truth markers (small dots over objects in the image)**
- **A panel containing line drawings of various objects and related textual descriptions is displayed**
- **The Analyst chooses the correct drawing/description representing an object in the image and clicks on the truth marker for that object**

ITT Identification Test (Continued)

- ITT consults a database of objects corresponding to each truth marker
- ITT informs the Analyst of incorrect and correct responses
- ITT logs a score of the results, and records the time taken for the identification

Evaluation of Test Results

With ITT, a test administrator can evaluate:

- the results of an individual Analyst for one image in a test
- the results of an individual Analyst for all images in a test
- the results of all Analysts for one image in a test
- the results of all Analysts for all images in a test

ITT Provides a Test/Lesson Generating Utility

With this utility, a test administrator can:

- prepare tutorial files
- prepare image files (may already be provided by ITT library of 80 images or can be input from tape)
- annotate and save each image
- add truth markers to the image and related descriptions to ITT database

ITT Image Formats

ITT can read image files in the following formats:

- NITF
- Rasterfile
- DIDOP/IDEX II
- Wide Band (12-bit SARS imagery)
- ASARS
- IR-sourced imagery

Use of ITT for MIL-STD-2525 Validation Testing

- An image or map is displayed with truth markers - next to each truth marker is an associated MIL-STD-2525 symbol
- A panel containing textual descriptions of various MIL-STD-2525 attributes (Affiliations, Dimensions, Positions, or specific symbol identities) is displayed
- The Analyst chooses the correct attribute for a symbol on the image or map and clicks on the truth marker for that symbol

Use of ITT for MIL-STD-2525 Validation Testing (Continued)

- ITT consults a database of MIL-STD-2525 attributes corresponding to each truth marker
- ITT informs the Analyst of incorrect and correct responses
- ITT logs a score of the results, and records the time taken for the identification

Summary

Benefit of using ITT for MIL-STD-2525 Validation Test:

- ITT is an existing GOTS product
- ITT provides a sophisticated identification test framework which administers the test and maintains test results
- ITT provides extensive image and annotation display capabilities

Prerequisites for ITT's Use in the Validation Test:

- Obtain map products (ADRG, etc.) in a format that can be imported into ITT
- Verify that ITT can facilitate the display of MIL-STD-2525 symbols with the required colors, fills, sizes, etc.

Interactive Training Tool (ITT)

hat is ITT?

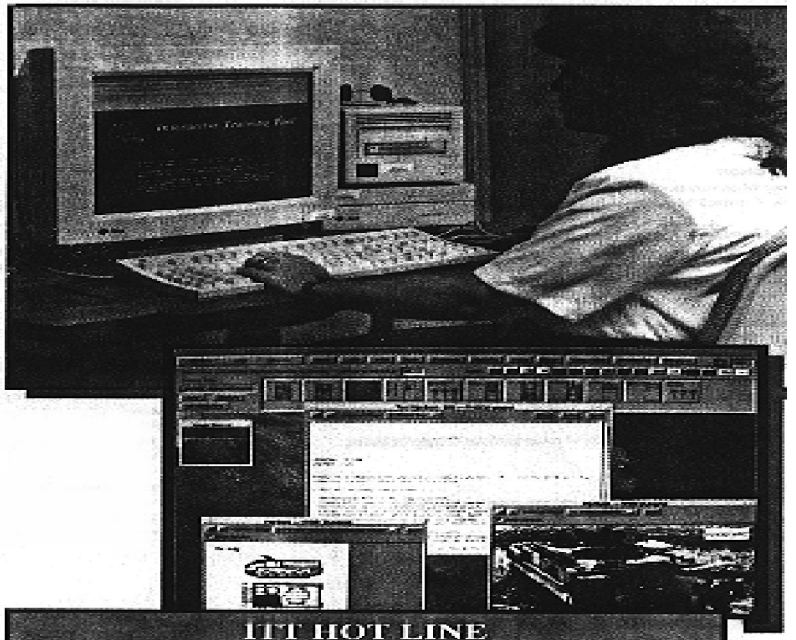
ITT is an inexpensive computer-based training BT) tool designed for formal classroom or exportable, f-paced, on-the-job training of imagery analysts. ITT s been designed for a wide variety of imagery applicable many classes of problems.

hat is the status of ITT?

ITT is currently deployed worldwide at twenty-one S. Army, Air Force, and joint service sites. Courseware, /eloped for military applications, consists of more than) images with reference materials on 1,000 objects ating to radar, optical, and infrared imagery. A class- m with 18 workstations has been installed at the U.S. ny Intelligence Training Center, Ft. Huachuca, Arizona, l a number of courses are being taught using ITT. We actively engaged in delivering ITT to other sites and /eloping more courses.

hat is the value of ITT?

ITT makes the instruction more productive. Stu- nts proceed at their own pace and their progress can be nitored for remediation. The tool facilitates rapid dating of training materials and codifies the knowledge subject matter experts. Students find the interactive tures of ITT both entertaining and stimulating.



ITT HOT LINE

ARMY SPACE PROGRAM OFFICE
(703) 275-5993 DSN: 235-5993

ASPO
ARMY SPACE PROGRAM OFFICE

ARMY SPACE PROGRAM OFFICE

ITT

Interactive Training Tool (ITT)

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Guide Help, Digitized Reference Guides & Keys
Tied to Each Object in Lesson
Data Access via Query
Reference Help in Online Books

Hardcopy Printing Capabilities

ercise & Examination Options

Choice Icon-Based Exercises/Exams
Images & Paper Test Handout
ges for Search Exercises & Exams

Product Options

- Primary Product Is IA Training Courseware (Lessons) on Magneto-Optical Disk Cartridges
- Operational Target Area Training for Tactical Users Is an Option
- Secondary ITT Products
- RG&K Material Production
- Formal Printed Pages
- Informal SAC or Printed Reference Guide Material
- Target Material Production

Exportable Lesson Media

- Magneto-Optical disks, 550 megabytes
- About 80 Images & Associated Reference Files per Disk

ITT Instructor and Student Training

Student - Training lessons are based on annotated imagery with multiple choice items supported by extensive help files in the form of image, graphic, and text-based reference materials. Student system operation training takes about 1 hour. Student progress is recorded for instructor monitoring and evaluation.

Courseware Authoring - Instructors use workstations and peripherals to build courses. Authoring requires no programming experience. Full authoring competency can be achieved in 2-3 days following 3-4 hours of instruction and hands-on practice.

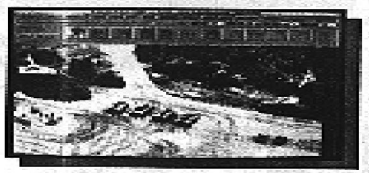
Data Acquisition and Management - Imagery and cul

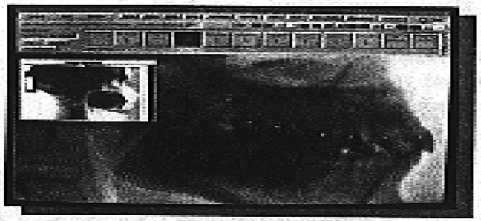
data are input via the instructor workstation. Operator store data, slice and manipulate imagery, and build hu the instructor workstation equipment, operators can at operating capability in a few hours and full database c a few days.

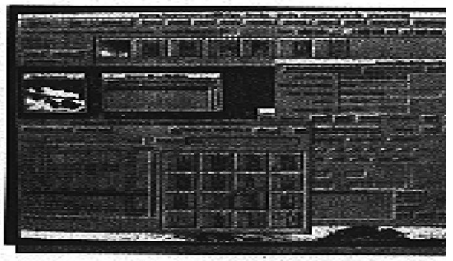
Hardware Requirements

Student Workstation
Sun SPARC or Equivalent Unix Workstation
Color Graphics Accelerator
64-Mbyte Memory
Magneto-Optical Disk Drive

Instructor Workstation
Sun SPARC 20 or Equivalent Unix Workstation
Color Graphics Accelerator
128-Mbyte Memory
5 Gbyte Disk
2 Magneto-Optical Disk Drives
8mm Tape Drive
Document Scanner
Film Quality Digitizer
LaserWriter
Image Printer: Kodak 7720 or Equivalent







ENCLOSURE 4

Validation Test Plan for MIL-STD 2525
Common Warfighting Symbology:
I. Operator Performance Assessment
(13 Sep 96 DRAFT)

I. Objective

The purpose of the validation testing of MIL-STD 2525 warfighting symbology is to evaluate its effectiveness in an operational environment. The validation will include both operator performance testing and an assessment of the symbology in an operational exercise. The test plan presented here addresses the operator testing portion of the validation and describes procedures for assessing both automated and manual rendering of the symbols. This testing will determine if the new symbology provides performance statistics (in terms of speed and accuracy) similar to those for existing symbol sets and if it causes significant confusability problems (e.g., mistaking friend for enemy) for operators.

II. Automated Test Procedure

Automated testing will be performed using existing tactical hardware and operational software and be conducted at various individual and joint service sites (see assumption #1). The software will be instrumented for performance recording so that it can present the test session and record operator responses. The test session will be conducted with the operator seated at normal viewing distance from the workstation monitor. While the focus of the validation will be to assess performance on workstations with high-resolution color monitors and under normal (i.e., standard office) ambient lighting, testing will also include various types and sizes of displays (e.g., low-resolution and monochrome) and other viewing conditions (e.g., bright daylight, low-light, dark-room).

The effectiveness of the new symbology will be assessed by measuring operator performance in a symbol recognition task (see assumption #2). A description of the task (e.g., select all hostile air tracks) will be displayed on the workstation monitor. The operator will click on a Start button to present a set of symbols displayed on a map background and start the clock. The operator will select (i.e., click on) the symbols that match the task and then click on a Done button when finished to stop clock. The elapsed time and number of errors will be recorded, after which the next task description will be presented. The operator will perform symbol selection under time stress to simulate operational conditions and allow the opportunity for errors to occur (so that confusability problems can be identified).

The testing session will begin by presenting a series of symbol recognition tasks using current symbology in order to obtain performance metrics for comparing the data collected on the new symbology. Baseline performance will be measured using the symbol set with which the operator is already familiar (i.e., either "force domain" or "engagement domain" symbology). The operator will then be provided with training on

the new symbology. The training will explain how the new symbols are constructed and provide sufficient practice for the operator to establish a base level of proficiency. The operator will then be given another series of symbol recognition tasks, this time using the new symbology.

The symbology will be presented on a tactical display representative of what the operator would encounter in a joint environment. The STANAG 4420 testing results along with guidelines from the human factors literature will be used as the basis for defining the symbol size, luminance (i.e., symbol/background contrast), color, and font under various viewing conditions. The operator will be tested on symbology at all levels of the symbol hierarchy (i.e., from most complex to most primitive); however, all of the symbols on a given display will be at the same level of the hierarchy. In addition, symbols will be positioned in operationally meaningful groups on each display, with distractor symbols that are similar in appearance to the target(s) included in order to identify potential confusability problems.

The assessment will measure performance with the new symbology when various elements of the tactical display are manipulated. A number of map products will be selected to represent the range of backgrounds upon which the new symbology will likely be displayed. It is expected that these backgrounds will range from single-color (e.g., open ocean displayed in black, gray, or blue) to detailed, multi-color (e.g., terrain elevation data) and include at least five levels of complexity. The presence of tactical graphics will be manipulated to determine the extent to which they impact performance on the symbol recognition task and are confusable with the new symbology. The assessment will measure operator performance when tactical graphics are absent, when they are present to a limited degree, and when they are used extensively. Finally, the symbology will be presented at varying levels of density in order to assess the impact of clutter and overlap among symbols on operator performance.

Testing will be conducted with enlisted and officer operators from each participating organization. Past experience with current symbol sets will be recorded in order to determine if the degree of familiarity with existing symbology has impact on performance with new symbology. Sufficient data will be collected to provide stable assessment of operator performance, and data analysis will include appropriate descriptive and comparative statistics calculated on the each of the performance measures.

III. Manual Test Procedure

Manual testing will be performed in conjunction with the automated testing and limited to operators with experience in this form of symbol rendering. This part of the assessment will measure the extent to which the new symbology can be produced and recognized by operators. In one testing scenario, the operator will be given a template (or shown one of the automated displays) containing elements from the symbol set and asked to draw them as quickly as possible. In another testing scenario, the operator will be given a set of hand-drawn symbols and asked to identify the entity represented. The symbology will be assessed in terms of the speed and accuracy of operator performance in the two scenarios.

IV. Schedule

It is estimated that the operator testing portion of the validation will require twelve months to execute, from the time funding is identified and the Symbology Standards Management Committee (SSMC) identifies an executive agent for performing the assessment (see assumption #3) until the results are reported back to the SSMC. The following schedule of key activities is provided:

Month 1: Identify an executive agent; prepare and approve detailed test plan; identify performance instrumentation software to be developed (see assumption #4).

Month 2-6: Complete development of instrumentation software; identify operational scenarios, create test protocols and training materials, arrange for distribution to test sites.

Month 7-10: Conduct data collection at test sites (assumption #5).

Month 11-12: Perform data analysis, prepare summary report, brief results to SSMC.

V. Budget

The cost of the software instrumentation task is estimated to be $200K. In addition, each participating organization will have to contribute one labor-month of effort towards the development of operational scenarios and test protocols (to ensure that they represent the full range of operational settings in which the symbology is expected to be used).

The cost estimate for development of testing materials, data collection, analysis, and reporting is estimated to be $600K. In addition, each participating organization will be expected to provide access to space, workstations, and operators and participate in the oversight of data collection efforts at each site during the testing period.

VI. Assumptions/Risks

1. The specific tactical hardware and software to be used in the validation testing has not yet been identified. One option would be to implement the symbology and add performance instrumentation capabilities to the mapping software in the Defense Information Infrastructure Common Operating Environment. The test suite could then be installed on any of the hardware configurations supported by the Global Command and Control System (GCCS), and each participating organization could make use existing hardware to perform testing at any of its facilities where GCCS-based systems are installed. Another option would be to implement the symbology in one or more simulators in order to capitalize on performance measurement capabilities already resident in these systems; in this case, testing would be conducted at facilities where these simulators are currently available.

2. The current test plan assumes that training on the new symbology can be automated along with the rest of the data collection. The effectiveness of this approach in producing an acceptable level of proficiency with the new symbology will need to be determined. If automated training is found to be ineffective, it is possible that a data collection coordinator will be needed at each test site to deliver the symbol training and ensure the testing is conducted as planned. This form of oversight will increase the cost (in labor and travel) of the assessment and likely require an extension in the length of the data collection period.

3. The SSMC will identify an executive agent who has overall responsibility for performing the validation. The agent will prepare a detailed test plan, coordinate the development of instrumentation software and testing materials, provide oversight during testing, and produce the final test report. Members of the SSMC will approve the test plan prior to its implementation and receive periodic reports on test progress.

4. It is not known at this time whether access to source code will be required in order to develop the performance measurement module. If access is required, it may be necessary to award the task to the developer who "owns" that software, with the ability to complete the task according to the proposed schedule contingent upon developer availability. If access to source code is not required, the choice of developer will be less constrained; however, more time may be required to complete the task because the developer is unfamiliar with the software (resulting in possible slippage in the schedule).

5. Each participating organization will select the operators and locations for its portion of the validation testing. Locations are expected to include laboratory environments, command centers, simulation facilities, and field sites; operators may be specifically selected to participate in the data collection or may be included as part of a larger exercise (e.g., Prairie Warrior). The executive agent for the validation will monitor activities at the test sites to ensure that data collection is being conducted in accordance with the test plan.